DRINKING WATER SURVEILLANCE PROGRAM

GRIMSBY WATER TREATMENT PLANT

ANNUAL REPORT 1990

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WATER TREATMENT PLANT

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

GRIMSBY WATER TREATMENT PLANT
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Grimsby water treatment plant is a conventional treatment plant which treats water from Lake Ontario. The process consists of coagulation, flocculation, sedimentation, filtration, taste and odour control and disinfection. This plant has a designed capacity of 20.9 x 1000 m^3/day. The Grimsby water treatment plant serves a population of approximately 17,900.

Water at the plant and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Grimsby water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

93-02443/

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE RAW TESTS	RAW POSITIVE	RAW %POSITIVE	TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE
BACTERIOLOGICAL	15	13	86	5	1	20	5	3	60
CHEMISTRY (FLD)	18	17	94	29	28	96	64	40	62
CHEMISTRY (LAB)	132	115	87	132	98	74	228	192	84
METALS	144	69	47	144	54	37	276	129	46
CHLOROAROMATICS	84	0	0	84	0	0	84	0	0
CHLOROPHENOLS	12	0	0	12	0	0	.	.	.
PAH	101	0	0	101	0	0	17	0	0
PESTICIDES & PCB	204	0	0	204	0	0	127	0	0
PHENOLICS	5	0	0	6	0	0	.	.	.
SPECIFIC PESTICIDES	50	0	0	50	0	0	6	0	0
VOLATILES	174	0	0	174	24	13	174	24	13
TOTAL	939	214		941	205		981	388	

DRINKING WATER SURVEILLANCE PROGRAM

GRIMSBY WATER TREATMENT PLANT
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Grimsby water treatment plant in the winter of 1987. Previous annual reports have been published for 1987, 1988 and 1989.

PLANT DESCRIPTION

The Grimsby water treatment plant is a conventional treatment plant which treats water from Lake Ontario. The process consists of coagulation, flocculation, sedimentation, filtration, taste and odour control and disinfection. This plant has a designed capacity of 20.9 x 1000 m^3/day. The Grimsby water treatment plant serves a population of approximately 17,900.

The sample day flows ranged from 6.6 x 1000 m^3/day to 8.0 x 1000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow

sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count was the only bacteriological analysis conducted on the treated and distributed water. No results were reported above the guideline.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 3 of 11 treated and distributed water samples with a maximum reported value of 19.0°C.

CHEMISTRY (LAB)

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in 12 of 12 treated and distributed water samples with a maximum reported value of 146.7 mg/L.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWO Maximum Acceptable Concentration for turbidity is 1.0 Formazin Turbidity Units (FTU).

The one laboratory turbidity value of 1.5 FTU, which exceeded the Maximum Acceptable Concentration, was not confirmed by the corresponding field turbidity. The field turbidity analysis is considered more reliable.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 5 of 12 treated and distributed water samples with a maximum reported value of 270.0 ug/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected above trace levels.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

The results of the regular pesticide scan showed that none were detected above trace levels.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results were reported above trace levels.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 12 treated and distributed water samples analyzed with a maximum level of 39.0 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

The Grimsby water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

No known health related guidelines were exceeded.

FIGURE 1

GRIMSBY WTP

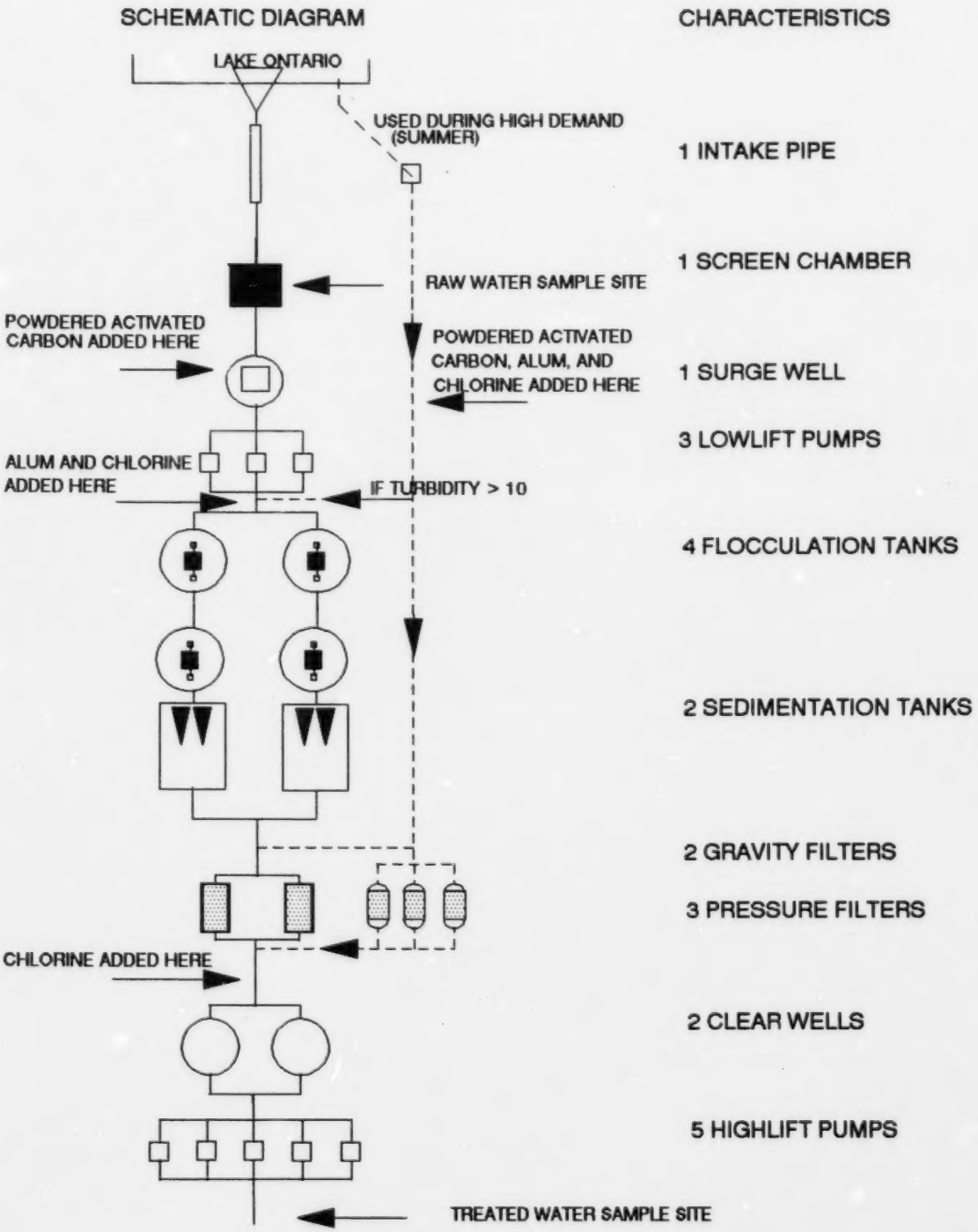

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 220001995
PLANT NAME: GRIMSBY WTP

DISTRICT: WELLAND
REGION: WEST CENTRAL
DISTRICT OFFICER :J. VOGT

UTM #: 176176504784450

PLANT SUPERINTENDENT: MR ANDREW FORBES

ADDRESS: 447 ELIZABETH STREET
GRIMSBY, ONTARIO
L3M 4H3
(416 945 4323)

MUNICIPALITY: REGIONAL MUN. OF NIAGARA
AUTHORITY: MUNICIPAL

PLANT INFORMATION

PLANT VOLUME:	-	(X 1000 M3)
DESIGN CAPACITY:	20.910	(X 1000 M3/DAY)
RATED CAPACITY:	19.321	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
HAMILTON WENTWORTH REGION	200
GRIMSBY	15,472
SMITHVILLE (WEST LINCOLN)	2,409

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
FREE CHLORINE RESIDUAL	AFTER FILTERS	EVERY 4 HOURS
	AFTER SETTLING TANKS	EVERY 4 HOURS
	TREATED WATER	EVERY 4 HOURS
TOTAL CHLORINE RESIDUAL	TREATED WATER	EVERY 4 HOURS
TEMPERATURE	RAW WATER	DAILY READING
TURBIDITY	TREATED WATER	EVERY 4 HOURS

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGE (MG/L)		
			PRE CHLORINATION	COAGULATION	POST CHLORINATION
			CHLORINE	ALUM LIQUID	CHLORINE
DATE	DELAY * TIME(HRS)	FLOW (1000M3)			
JAN 16	3.66	8.022	.52	26.12	.05
MAR 20	5.50	7.995	1.24	9.37	.17
MAY 22	5.50	6.607	.97	61.93	.25
JUL 17	3.00	8.009	1.64	13.96	.22
SEP 18	6.78	8.053	1.51	16.83	.19

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL									
FECAL COLIFORM MF	5	3	0	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	5	1	0	5	3	0
TOTAL COLIFORM MF	5	5	0	.	.	.	.	.	.
T COLIFORM BCKGRD MF	5	5	0	.	.	.	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	15	13	0	5	1	0	5	3	0
CHEMISTRY (FLD)									
FLD CHLORINE (COMB)	1	1	0	5	5	0	12	3	0
FLD CHLORINE FREE	1	1	0	5	5	0	12	4	0
FLD CHLORINE (TOTAL)	1	1	0	5	5	0	12	5	0
FLD PH	5	5	0	4	4	0	12	12	0
FLD TEMPERATURE	5	4	0	5	4	0	12	12	0
FLD TURBIDITY	5	5	0	5	5	0	4	4	0
*TOTAL SCAN CHEMISTRY (FLD)	18	17	0	29	28	0	64	40	0
CHEMISTRY (LAB)									
ALKALINITY	6	6	0	6	6	0	12	12	0
CALCIUM	6	6	0	6	6	0	12	12	0
CYANIDE	6	0	0	6	1	0	.	.	.
CHLORIDE	6	6	0	6	6	0	12	12	0
COLOUR	6	1	4	6	0	5	12	1	11
CONDUCTIVITY	6	6	0	6	6	0	12	12	0
DISS ORG CARBON	6	6	0	6	6	0	12	12	0
FLUORIDE	6	6	0	6	6	0	12	12	0
HARDNESS	6	6	0	6	6	0	12	12	0
IONCAL	6	6	0	6	6	0	12	12	0
LANGELIERS INDEX	6	6	0	6	6	0	12	12	0
MAGNESIUM	6	6	0	6	6	0	12	12	0
SODIUM	6	6	0	6	6	0	12	12	0
AMMONIUM TOTAL	6	3	1	6	0	2	12	1	6
NITRITE	6	6	0	6	1	4	12	1	11
TOTAL NITRATES	6	6	0	6	6	0	12	12	0
NITROGEN TOT KJELD	6	6	0	6	6	0	12	12	0
PH	6	6	0	6	6	0	12	12	0
PHOSPHORUS FIL REACT	6	3	1	6	0	2	.	.	.
PHOSPHORUS TOTAL	6	6	0	6	1	5	.	.	.
SULPHATE	6	6	0	6	6	0	12	12	0
TURBIDITY	6	6	0	6	5	1	12	9	3
*TOTAL SCAN CHEMISTRY (LAB)	132	115	6	132	98	19	228	192	31

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS									
SILVER	6	0	0	6	0	0	12	0	0
ALUMINUM	6	6	0	6	6	0	12	12	0
ARSENIC	6	3	3	6	0	6	12	0	12
BARIUM	6	6	0	6	6	0	12	12	0
BORON	6	6	0	6	6	0	12	12	0
BERYLLIUM	6	0	2	6	0	1	12	0	1
CADMIUM	6	0	0	6	0	1	12	0	5
COBALT	6	0	6	6	1	4	12	0	10
CHROMIUM	6	1	4	6	1	5	12	0	12
COPPER	6	4	2	6	0	6	12	7	5
IRON	6	5	1	6	0	2	12	3	8
MERCURY	6	1	0	6	2	0	.	.	.
MANGANESE	6	6	0	6	5	1	12	12	0
MOLYBDENUM	6	5	1	6	6	0	12	12	0
NICKEL	6	1	5	6	0	5	12	4	7
LEAD	6	3	3	6	1	3	12	9	3
ANTIMONY	6	4	2	6	3	3	12	8	4
SELENIUM	6	0	0	6	0	5	12	0	8
STRONTIUM	6	6	0	6	6	0	12	12	0
TITANIUM	6	4	2	6	2	4	12	4	8
THALLIUM	6	0	1	6	0	0	12	0	0
URANIUM	6	0	6	6	0	6	12	0	12
VANADIUM	6	2	4	6	5	1	12	10	2
ZINC	6	6	0	6	4	2	12	12	0
*TOTAL SCAN METALS	144	69	42	144	54	55	276	129	97
*TOTAL GROUP INORGANIC & PHYSICAL	294	201	48	305	180	74	568	361	128
CHLOROAROMATICS									
HEXACHLOROBUTADIENE	6	0	0	6	0	0	6	0	0
123 TRICHLOROBENZENE	6	0	0	6	0	0	6	0	0
1234 T-CHLOROBENZENE	6	0	0	6	0	0	6	0	0
1235 T-CHLOROBENZENE	6	0	0	6	0	0	6	0	0
124 TRICHLOROBENZENE	6	0	0	6	0	0	6	0	0
1245 T-CHLOROBENZENE	6	0	0	6	0	0	6	0	0
135 TRICHLOROBENZENE	6	0	0	6	0	0	6	0	0
HCB	6	0	0	6	0	0	6	0	0
HEXACHLOROETHANE	6	0	1	6	0	1	6	0	0
OCTACHLOROSTYRENE	6	0	0	6	0	0	6	0	0
PENTACHLOROBENZENE	6	0	0	6	0	0	6	0	0
236 TRICHLOROTOLUENE	6	0	0	6	0	0	6	0	0
245 TRICHLOROTOLUENE	6	0	0	6	0	0	6	0	0
26A TRICHLOROTOLUENE	6	0	0	6	0	0	6	0	0
*TOTAL SCAN CHLOROAROMATICS	84	0	1	84	0	1	84	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROPHENOLS									
234 TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.
2345 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.
2356 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.
245-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.
246-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.
PENTACHLOROPHENOL	2	0	0	2	0	0	.	.	.
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	0	0	0	0
PAH									
PHENANTHRENE	6	0	0	6	0	0	1	0	0
ANTHRACENE	6	0	0	6	0	0	1	0	0
FLUORANTHENE	6	0	0	6	0	0	1	0	0
PYRENE	6	0	0	6	0	0	1	0	0
BENZO(A)ANTHRACENE	6	0	0	6	0	0	1	0	0
CHRYSENE	6	0	0	6	0	0	1	0	0
DIMETH. BENZ(A)ANTHR	5	0	0	5	0	0	1	0	0
BENZO(E) PYRENE	6	0	0	6	0	0	1	0	0
BENZO(B) FLUORANTHEN	6	0	0	6	0	0	1	0	0
PERYLENE	6	0	0	6	0	0	1	0	0
BENZO(K) FLUORANTHEN	6	0	0	6	0	0	1	0	0
BENZO(A) PYRENE	6	0	0	6	0	0	1	0	0
BENZO(G,H,I) PERYLEN	6	0	0	6	0	0	1	0	0
DIBENZO(A,H) ANTHRAC	6	0	0	6	0	0	1	0	0
INDENO(1,2,3-C,D) PY	6	0	0	6	0	0	1	0	0
BENZO(B) CHRYSENE	6	0	0	6	0	0	1	0	0
CORONENE	6	0	0	6	0	0	1	0	0
*TOTAL SCAN PAH	101	0	0	101	0	0	17	0	0
PESTICIDES & PCB									
ALDRIN	6	0	0	6	0	0	6	0	0
ALPHA BHC	6	0	4	6	0	5	6	0	4
BETA BHC	6	0	0	6	0	0	6	0	0
LINDANE	6	0	1	6	0	0	6	0	0
ALPHA CHLORDANE	6	0	0	6	0	0	6	0	0
GAMMA CHLORDANE	6	0	0	6	0	0	6	0	0
DIELDRIN	6	0	0	6	0	0	6	0	0
METHOXYCHLOR	6	0	0	6	0	0	6	0	0
ENDOSULFAN I	6	0	0	6	0	0	6	0	0
ENDOSULFAN II	6	0	0	6	0	0	6	0	0
ENDRIN	6	0	0	6	0	0	6	0	0
ENDOSULFAN SULPHATE	6	0	0	6	0	0	6	0	0
HEPTACHLOR EPOXIDE	6	0	0	6	0	0	6	0	0
HEPTACHLOR	6	0	0	6	0	0	6	0	0
MIREX	6	0	0	6	0	0	6	0	0
OXYCHLORDANE	6	0	0	6	0	0	6	0	0
OPDDT	6	0	0	6	0	0	6	0	0
PCB	6	0	0	6	0	0	6	0	0
DDD	6	0	0	6	0	0	6	0	0
PPDDE	6	0	0	6	0	0	6	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	6	0	0	6	0	0	6	0	0
AMETRINE	6	0	0	6	0	0	.	.	.
ATRAZINE	6	0	4	6	0	3	.	.	.
ATRATONE	6	0	0	6	0	0	.	.	.
CYANAZINE (BLADEX)	6	0	0	6	0	0	.	.	.
DESETHYLATRAZINE	6	0	0	6	0	0	.	.	.
D-ETHYL SIMAZINE	5	0	0	5	0	0	.	.	.
PROMETONE	6	0	0	6	0	0	.	.	.
PROPAZINE	6	0	0	6	0	0	.	.	.
PROMETRYNE	6	0	0	6	0	0	.	.	.
METRIBUZIN (SENCOR)	6	0	0	6	0	0	.	.	.
SIMAZINE	6	0	0	6	0	0	.	.	.
ALACHLOR (LASSO)	6	0	0	6	0	0	.	.	.
METOLACHLOR	6	0	0	6	0	0	.	.	.
HEXACLCYCLOPENTADIEN	1	0	0	1	0	0	1	0	0
*TOTAL SCAN PESTICIDES & PCB	204	0	9	204	0	8	127	0	4
PHENOLICS									
PHENOLICS	5	0	3	6	0	3	.	.	.
*TOTAL SCAN PHENOLICS	5	0	3	6	0	3	0	0	0
SPECIFIC PESTICIDES									
TOXAPHENE	6	0	0	6	0	0	6	0	0
2,4,5-T	2	0	0	2	0	0	.	.	.
2,4-D	2	0	0	2	0	0	.	.	.
2,4-DB	2	0	0	2	0	0	.	.	.
2,4 D PROPIONIC ACID	2	0	0	2	0	0	.	.	.
DICAMBA	2	0	0	2	0	0	.	.	.
PICHLORAM	0	0	0	0	0	0	.	.	.
SILVEX	2	0	0	2	0	0	.	.	.
DIAZINON	2	0	0	2	0	0	.	.	.
DICHLOROVOS	2	0	0	2	0	0	.	.	.
CHLORPYRIFOS	2	0	0	2	0	0	.	.	.
ETHION	2	0	0	2	0	0	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.
MALATHION	2	0	0	2	0	0	.	.	.
MEVINPHOS	2	0	0	2	0	0	.	.	.
METHYL PARATHION	2	0	0	2	0	0	.	.	.
METHYLTRITHION	2	0	0	2	0	0	.	.	.
PARATHION	2	0	0	2	0	0	.	.	.
PHORATE	2	0	0	2	0	0	.	.	.
RELDAN	2	0	0	2	0	0	.	.	.
RONNEL	2	0	0	2	0	0	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.
BENOMYL	0	0	0	0	0	0	.	.	.
BUX	0	0	0	0	0	0	.	.	.
CARBOFURAN	1	0	0	1	0	0	.	.	.
CICP	1	0	0	1	0	0	.	.	.
DIALLATE	1	0	0	1	0	0	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	1	0	0	1	0	0	.	.	.
IPC	1	0	0	1	0	0	.	.	.
PROPOXUR	1	0	0	1	0	0	.	.	.
CARBARYL	1	0	0	1	0	0	.	.	.
BUTYLATE	1	0	0	1	0	0	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	50	0	0	50	0	0	6	0	0
VOLATILES									
BENZENE	6	0	0	6	0	1	6	0	1
TOLUENE	6	0	2	6	0	1	6	0	1
ETHYLBENZENE	6	0	3	6	0	2	6	0	3
P-XYLENE	6	0	0	6	0	0	6	0	0
M-XYLENE	6	0	0	6	0	0	6	0	0
O-XYLENE	6	0	0	6	0	0	6	0	0
STYRENE	6	0	4	6	0	3	6	0	5
1,1 DICHLOROETHYLENE	6	0	0	6	0	0	6	0	0
METHYLENE CHLORIDE	6	0	0	6	0	0	6	0	0
T1,2DICHLOROETHYLENE	6	0	0	6	0	0	6	0	0
1,1 DICHLOROETHANE	6	0	0	6	0	0	6	0	0
CHLOROFORM	6	0	1	6	6	0	6	6	0
111, TRICHLOROETHANE	6	0	1	6	0	0	6	0	0
1,2 DICHLOROETHANE	6	0	0	6	0	0	6	0	0
CARBON TETRACHLORIDE	6	0	0	6	0	0	6	0	0
1,2 DICHLOROPROPANE	6	0	0	6	0	0	6	0	0
TRICHLOROETHYLENE	6	0	0	6	0	0	6	0	0
DICHLOROBROMOMETHANE	6	0	1	6	6	0	6	6	0
112 TRICHLOROETHANE	6	0	0	6	0	0	6	0	0
CHLORODIBROMOMETHANE	6	0	1	6	6	0	6	6	0
T-CHLOROETHYLENE	6	0	0	6	0	0	6	0	0
BROMOFORM	6	0	0	6	0	5	6	0	6
1122 T-CHLOROETHANE	6	0	0	6	0	0	6	0	0
CHLOROBENZENE	6	0	0	6	0	0	6	0	0
1,4 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0
1,3 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0
1,2 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0
ETHLYENE DIBROMIDE	6	0	0	6	0	0	6	0	0
TOTL TRIHALOMETHANES	6	0	1	6	6	0	6	6	0
*TOTAL SCAN VOLATILES	174	0	14	174	24	12	174	24	16
*TOTAL GROUP ORGANIC	630	0	27	631	24	24	408	24	20

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR		Unreliable: Could Not Confirm By Reanalysis
UCS		Unreliable: Contamination Suspected
UIN		Unreliable: Indeterminate Interference
XP		Positive After X Number Of Hours
T#	(T06)	Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
BACTERIOLOGICAL				
FECAL COLIFORM MF (CT/100ML)			**DET'N LIMIT = 0**	**GUIDELINE = 0 (A1)**
JAN	2	.	.	.
MAR	BDL	.	.	.
MAY	588	.	.	.
JUL	20 <=>	.	.	.
SEP	44	.	.	.
STANDRD PLATE CNT MF (COUNTS/ML)			**DET'N LIMIT = 0**	**GUIDELINE = 500/ML (A3)**
JAN	.	0 <=>	.	1 <=>
MAR	.	71	.	11
MAY	.	2 <=>	.	1 <=>
JUL	.	8 <=>	.	.
SEP	.	6 <=>	.	18
NOV	.	.	.	12
TOTAL COLIFORM MF (CT/100ML)			**DET'N LIMIT = 0**	**GUIDELINE = 5/100ML(A1)**
JAN	112	.	.	.
MAR	84	.	.	.
MAY	7600	.	.	.
JUL	15000	.	.	.
SEP	300	.	.	.
T COLIFORM BCKGRD MF (CT/100ML)			**DET'N LIMIT = 0**	**GUIDELINE = N/A**
JAN	236	.	.	.
MAR	276	.	.	.
MAY	32000	.	.	.
JUL	50000	.	.	.
SEP	9400	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHEMISTRY (FLD)				
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A
JAN	.	.100	.000	.100
MAR	.080	.090	.000	.200
MAY	.	.130	.000	.000
JUL	.	.200	.000	.300
SEP	.	.	.000	.000
NOV	.	.050	.000	.000
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A
JAN	.	.330	.000	.100
MAR	.250	.440	.100	.300
MAY	.	.470	.000	.100
JUL	.	.300	.000	.000
SEP	.	.	.000	.000
NOV	.	.550	.000	.000
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A
JAN	.	.430	.000	.200
MAR	.330	.530	.100	.500
MAY	.	.600	.000	.100
JUL	.	.500	.000	.300
SEP	.	.	.000	.000
NOV	.	.600	.000	.000
FLD PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)
JAN	7.900	.	7.400	7.400
MAR	7.600	7.600	7.800	7.400
MAY	7.900	7.350	7.200	7.400
JUL	8.000	7.600	7.400	7.200
SEP	.	.	7.800	7.600
NOV	7.700	7.400	7.800	7.000
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A	GUIDELINE = 15 (A3)
JAN	.000	.000	16.500	5.000
MAR	3.000	3.000	15.000	7.400
MAY	8.000	8.500	11.500	15.000
JUL	15.500	15.500	19.000	18.000
SEP	.	.	19.000	19.000
NOV	5.000	5.000	18.000	11.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A	GUIDELINE = 1 (A1)
JAN	18.000	.350	.	.210
MAR	8.000	.140	.	.
MAY	46.000	.100	.	.350
JUL	1.000	.100	.	.
SEP	.	.	.120	.100
NOV	5.200	.050	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHEMISTRY (LAB)				
ALKALINITY (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 30-500 (A3)
JAN	104.300	90.500	87.400	89.800
MAR	103.800	98.000	97.400	97.500
MAY	101.300	96.400	85.500	85.600
JUL	102.200	94.800	93.300	94.200
SEP	93.700	84.400	87.400	86.100
NOV	107.000	96.900	96.700	96.300
CALCIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 100 (F2)
JAN	42.800	42.800	43.600	43.900
MAR	41.000	40.400	41.200	40.400
MAY	44.000	39.000	42.800	42.400
JUL	42.200	41.700	41.500	43.000
SEP	38.000	38.600	38.800	38.600
NOV	41.200	41.400	40.000	41.400
CYANIDE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = .2 (A1)
JAN	BDL	BDL	.	.
MAR	BDL	.006	.	.
MAY	BDL	BDL	.	.
JUL	BDL	BDL	.	.
SEP	BDL	BDL	.	.
NOV	BDL	BDL	.	.
CHLORIDE (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 250 (A3)
JAN	24.800	26.200	27.100	27.900
MAR	29.200	30.600	30.900	30.100
MAY	29.800	18.400	28.600	28.300
JUL	24.100	25.200	25.100	25.300
SEP	21.600	23.400	22.700	22.400
NOV	25.000	25.900	25.400	25.500
COLOUR (HZU)			DET'N LIMIT = 0.5	GUIDELINE = 5 (A3)
JAN	1.500 <T	.500 <T	1.000 <T	1.500 <T
MAR	2.000 <T	1.000 <T	1.500 <T	1.500 <T
MAY	21.000	1.500 <T	2.000 <T	3.000
JUL	1.500 <T	.500 <T	.500 <T	.500 <T
SEP	1.500 <T	1.000 <T	1.500 <T	1.500 <T
NOV	BDL	BDL	.500 <T	1.000 <T
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.	GUIDELINE = 400 (F2)
JAN	344	355	353	355
MAR	359	362	364	361
MAY	376	321	367	362
JUL	332	332	329	330
SEP	304	310	311	306
NOV	350	355	351	349

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
DISS ORG CARBON (MG/L)			**DET'N LIMIT = .100**	**GUIDELINE = 5.0 (A3)**
JAN	1.900	1.400	1.600	1.400
MAR	1.900	1.800	2.000	1.800
MAY	4.900	2.500	2.100	2.100
JUL	1.900	1.900	1.800	1.700
SEP	2.000	1.600	1.600	1.600
NOV	1.800	1.500	1.500	1.400
FLUORIDE (MG/L)			**DET'N LIMIT = 0.01**	**GUIDELINE = 2.4 (A1)**
JAN	.140	.120	.100	.100
MAR	.140	.140	.160	.140
MAY	.180	.100	.100	.080
JUL	.140	.140	.140	.140
SEP	.120	.100	.100	.120
NOV	.140	.120	.120	.120
HARDNESS (MG/L)			**DET'N LIMIT = 0.5**	**GUIDELINE = 80-100 (A4)**
JAN	144.000	143.000	145.000	146.700
MAR	140.000	139.000	140.000	138.000
MAY	153.000	135.000	145.000	145.000
JUL	141.300	138.700	138.700	141.900
SEP	131.000	132.000	132.000	131.000
NOV	139.000	141.000	136.000	140.000
IONCAL (DMNSLESS)			**DET'N LIMIT = N/A**	**GUIDELINE = N/A**
JAN	1.854	1.021	3.284	1.295
MAR	1.424	2.607	2.331	1.857
MAY	1.002	1.235	.357	.671
JUL	2.774	1.877	2.293	4.313
SEP	1.807	2.012	1.263	2.389
NOV	4.480	3.261	4.504	1.858
LANGELIERS INDEX (DMNSLESS)			**DET'N LIMIT = N/A**	**GUIDELINE = N/A**
JAN	.584	.291	.095	.269
MAR	.552	.420	.366	.398
MAY	.480	.352	.136	.242
JUL	.500	.372	.334	.363
SEP	.361	.151	.108	.150
NOV	.618	.477	.481	.475
MAGNESIUM (MG/L)			**DET'N LIMIT = 0.1**	**GUIDELINE = 30 (F2)**
JAN	9.000	8.900	8.900	9.000
MAR	9.100	9.200	9.100	9.000
MAY	10.500	9.200	9.400	9.300
JUL	8.700	8.400	8.500	8.350
SEP	8.600	8.700	8.600	8.300
NOV	8.800	9.000	8.900	9.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
SODIUM (MG/L)		DET'N LIMIT = 0.2		GUIDELINE = 200 (A4)
JAN	14.000	14.000	15.000	14.000
MAR	15.800	15.400	15.600	15.600
MAY	16.200	10.400	15.000	15.000
JUL	13.600	13.400	13.000	13.500
SEP	11.800	11.400	11.000	11.600
NOV	13.200	13.200	12.600	12.800
AMMONIUM TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = 0.05 (F2)
JAN	BDL	BDL	BDL	BDL
MAR	BDL	BDL	.004 <T	.006 <T
MAY	.050	BDL	.002 <T	BDL
JUL	.042	.008 <T	.006 <T	.008 <T
SEP	.014	.002 <T	BDL	BDL
NOV	.008 <T	BDL	.010	.004 <T
NITRITE (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = 1 (A1)
JAN	.006	BDL	.001 <T	.001 <T
MAR	.011	.003 <T	.004 <T	.004 <T
MAY	.035	.002 <T	.003 <T	.003 <T
JUL	.009	.005	.003 <T	.005
SEP	.009	.004 <T	.001 <T	.003 <T
NOV	.006	.001 <T	.004 <T	.003 <T
TOTAL NITRATES (MG/L)		DET'N LIMIT = 0.005		GUIDELINE = 10 (A1)
JAN	.445	.465	.505	.520
MAR	.460	.470	.465	.465
MAY	.740	.325	.560	.520
JUL	.315	.315	.295	.300
SEP	.175	.165	.145	.150
NOV	.405	.390	.390	.385
NITROGEN TOT KJELD (MG/L)		DET'N LIMIT = 0.02		GUIDELINE = N/A
JAN	.220	.160	.160	.130
MAR	.350	.190	.210	.250
MAY	.850	.200	.210	.220
JUL	.310	.200	.190	.210
SEP	.320	.150	.170	.160
NOV	.190	.110	.120	.110
PH (DMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)
JAN	8.380	8.150	7.960	8.120
MAR	8.370	8.270	8.210	8.250
MAY	8.280	8.220	8.020	8.130
JUL	8.310	8.220	8.190	8.200
SEP	8.250	8.080	8.020	8.070
NOV	8.420	8.320	8.340	8.320

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
PHOSPHORUS FIL REACT (MG/L)			**DET'N LIMIT = 0.0005**	**GUIDELINE = N/A**
JAN	.002	.000 <T	.	.
MAR	BDL	BDL	.	.
MAY	.025	.000 <T	.	.
JUL	BDL	BDL	.	.
SEP	.000 <T	BDL	.	.
NOV	.003	BDL	.	.
PHOSPHORUS TOTAL (MG/L)			**DET'N LIMIT = 0.002**	**GUIDELINE = .40 (F2)**
JAN	.015	.002 <T	.	.
MAR	.029	.004	.	.
MAY	.132	.002 <T	.	.
JUL	.013	.003 <T	.	.
SEP	.028	.002 <T	.	.
NOV	.014	.002 <T	.	.
SULPHATE (MG/L)			**DET'N LIMIT = .200**	**GUIDELINE = 500 (A3)**
JAN	29.010	41.300	43.200	42.030
MAR	28.750	32.460	34.200	32.040
MAY	38.950	34.790	48.910	46.240
JUL	27.740	31.910	32.010	31.710
SEP	27.230	34.420	32.910	32.510
NOV	30.270	38.140	35.830	36.160
TURBIDITY (FTU)			**DET'N LIMIT = 0.05**	**GUIDELINE = 1 (A1)**
JAN	2.600	.250 <T	.270	.310
MAR	8.800	.330	.470	.210 <T
MAY	86.000	.530	.650	.840
JUL	1.400	.300	.240 <T	.280
SEP	30.000	.270	1.200	.320
NOV	8.700	1.500	.300	.210 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
METALS				
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)
JAN	51.000	130.000	57.000	81.000
MAR	83.000	96.000	90.000	92.000
MAY	520.000	120.000	34.000	38.000
JUL	25.000	230.000	120.000	270.000
SEP	140.000	100.000	110.000	140.000
NOV	66.000	52.000	19.000	53.000
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)
JAN	.780 <T	.230 <T	.330 <T	.230 <T
MAR	.850 <T	.240 <T	.210 <T	.150 <T
MAY	1.100	.360 <T	.340 <T	.250 <T
JUL	.650 <T	.440 <T	.230 <T	.390 <T
SEP	1.100	.350 <T	.420 <T	.570 <T
NOV	1.100	.390 <T	.470 <T	.370 <T
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)
JAN	2[illegible].000	23.000	22.000	22.000
MAR	25.000	23.000	22.000	22.000
MAY	33.000	21.000	25.000	24.000
JUL	22.000	23.000	23.000	21.000
SEP	26.000	23.000	24.000	23.000
NOV	24.000	23.000	20.000	22.000
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)
JAN	25.000	26.000	28.000	28.000
MAR	35.000	29.000	37.000	32.000
MAY	85.000	140.000	100.000	42.000
JUL	28.000	29.000	30.000	26.000
SEP	39.000	29.000	31.000	35.000
NOV	28.000	32.000	27.000	31.000
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)
JAN	BDL	BDL	BDL	BDL
MAR	.060 <T	BDL	BDL	BDL
MAY	.140 <T	.170 <T	.120 <T	BDL
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL
CADMIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)
JAN	BDL	BDL	.130 <T	BDL
MAR	BDL	BDL	BDL	BDL
MAY	BDL	.060 <T	.080 <T	.080 <T
JUL	BDL	BDL	.080 <T	BDL
SEP	BDL	BDL	BDL	BDL
NOV	BDL	BDL	.190 <T	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
COBALT (UG/L)			**DET'N LIMIT = 0.02**	**GUIDELINE = N/A**
JAN	.330 <T	.320 <T	.060 <T	BDL
MAR	.120 <T	1.200	.060 <T	.060 <T
MAY	.510 <T	.100 <T	.120 <T	.060 <T
JUL	.140 <T	.050 <T	.090 <T	.060 <T
SEP	.440 <T	.200 <T	.230 <T	.250 <T
NOV	.060 <T	BDL	.070 <T	BDL
CHROMIUM (UG/L)			**DET'N LIMIT = 0.50**	**GUIDELINE = 50 (A1)**
JAN	14.000	7.000	1.300 <T	1.600 <T
MAR	2.900 <T	1.700 <T	3.400 <T	2.600 <T
MAY	2.500 <T	4.300 <T	3.500 <T	1.200 <T
JUL	1.300 <T	1.600 <T	1.400 <T	1.300 <T
SEP	3.000 <T	1.400 <T	1.600 <T	2.500 <T
NOV	BDL	1.300 <T	.640 <T	1.000 <T
COPPER (UG/L)			**DET'N LIMIT = 0.50**	**GUIDELINE = 1000 (A3)**
JAN	5.400	1.200 <T	340.000	3.900 <T
MAR	4.900 <T	1.500 <T	220.000	4.000 <T
MAY	6.100	.830 <T	250.000	3.700 <T
JUL	8.800	2.200 <T	260.000	9.600
SEP	18.000	2.500 <T	7.200	2.900 <T
NOV	4.400 <T	1.800 <T	620.000	3.300 <T
IRON (UG/L)			**DET'N LIMIT = 6.00**	**GUIDELINE = 300 (A3)**
JAN	90.000	9.400 <T	21.000 <T	66.000
MAR	130.000	8.000 <T	28.000 <T	39.000 <T
MAY	440.000	BDL	16.000 <T	77.000
JUL	21.000 <T	BDL	17.000 <T	78.000
SEP	280.000	BDL	BDL	51.000 <T
NOV	110.000	BDL	7.900 <T	41.000 <T
MERCURY (UG/L)			**DET'N LIMIT = 0.02**	**GUIDELINE = 1 (A1)**
JAN	.160	.150	.	.
MAR	BDL	BDL	.	.
MAY	BDL	BDL	.	.
JUL	BDL	BDL	.	.
SEP	BDL	BDL	.	.
NOV	BDL	.120	.	.
MANGANESE (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 50 (A3)**
JAN	8.400	1.600	3.400	5.500
MAR	14.000	.700	2.900	4.700
MAY	41.000	1.500	5.800	11.000
JUL	5.200	.740	5.100	5.000
SEP	23.000	.420 <T	3.100	9.400
NOV	8.100	.700	4.200	7.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A
JAN	1.200	1.300	1.100	1.200
MAR	1.100	1.500	1.400	1.400
MAY	.410 <T	1.200	1.200	1.200
JUL	1.200	1.300	1.400	1.100
SEP	.940	1.300	1.300	1.300
NOV	1.100	1.100	1.200	1.200
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)
JAN	2.800	2.000 <T	2.200	1.300 <T
MAR	1.300 <T	.730 <T	.990 <T	.920 <T
MAY	1.200 <T	.640 <T	2.700	1.300 <T
JUL	.960 <T	.980 <T	19.000	1.200 <T
SEP	1.900 <T	1.400 <T	1.800 <T	1.800 <T
NOV	.260 <T	BDL	29.000	BDL
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)
JAN	.420 <T	BDL	44.000	.560
MAR	.600	BDL	13.000	.370 <T
MAY	1.900	.800	17.000	.370 <T
JUL	.460 <T	.330 <T	20.000	1.300
SEP	1.300	.120 <T	.610	.380 <T
NOV	.350 <T	.150 <T	29.000	.510
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)
JAN	.400 <T	.390 <T	.570	.530
MAR	.510	4.600	.660	.560
MAY	.380 <T	.260 <T	.430 <T	.330 <T
JUL	.670	.420 <T	.460 <T	.490 <T
SEP	.590	.610	.770	.630
NOV	.520	.570	.600	.590
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)
JAN	BDL	1.200 <T	1.300 <T	1.700 <T
MAR	BDL	1.400 <T	1.200 <T	BDL
MAY	BDL	1.800 <T	BDL	2.000 <T
JUL	BDL	BDL	BDL	BDL
SEP	BDL	2.800 <T	1.800 <T	2.700 <T
NOV	BDL	1.600 <T	2.000 <T	1.300 <T
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A
JAN	190.000	190.000	200.000	200.000
MAR	230.000	230.000	250.000	240.000
MAY	220.000	200.000	200.000	190.000
JUL	180.000	180.000	190.000	170.000
SEP	190.000	190.000	180.000	180.000
NOV	180.000	180.000	170.000	180.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
TITANIUM (UG/L)			**DET'N LIMIT = 0.50**	**GUIDELINE = N/A**
JAN	3.800 <T	2.200 <T	2.400 <T	2.300 <T
MAR	6.300	2.800 <T	3.300 <T	3.500 <T
MAY	15.000	6.900	7.200	6.600
JUL	8.600	8.500	8.300	7.400
SEP	6.500	2.900 <T	3.000 <T	3.200 <T
NOV	3.300 <T	1.500 <T	1.400 <T	1.400 <T
THALLIUM (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 13 (D4)**
JAN	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL
MAY	.070 <T	BDL	BDL	BDL
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL
URANIUM (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 100 (A1)**
JAN	.350 <T	.130 <T	.130 <T	.170 <T
MAR	.320 <T	.310 <T	.250 <T	.320 <T
MAY	.380 <T	.310 <T	.110 <T	.130 <T
JUL	.210 <T	.270 <T	.150 <T	.220 <T
SEP	.340 <T	.200 <T	.180 <T	.190 <T
NOV	.390 <T	.230 <T	.080 <T	.250 <T
VANADIUM (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = N/A**
JAN	.430 <T	1.400	.840	1.100
MAR	.400 <T	.690	.790	.840
MAY	1.000	.490 <T	.800	.740
JUL	.200 <T	.560	.550	1.100
SEP	.650	.590	.500 <T	.600
NOV	.320 <T	.550	.280 <T	.540
ZINC (UG/L)			**DET'N LIMIT = 0.20**	**GUIDELINE = 5000 (A3)**
JAN	5.100	2.900	300.000	3.800
MAR	3.800	1.600 <T	81.000	3.100
MAY	8.100	1.200 <T	280.000	4.100
JUL	2.200	3.800	480.000	9.100
SEP	4.300	5.900	8.200	2.900
NOV	3.500	4.500	720.000	5.300

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHLOROAROMATICS				
HEXACHLOROETHANE (NG/L)		DET'N LIMIT = 1.000		GUIDELINE = 1900 (D4)
JAN	BDL	BDL	.	BDL
MAR	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
JUL	BDL	BDL	.	BDL
SEP	BDL	BDL	.	BDL
NOV	2.000 <T	3.000 <T	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
PESTICIDES & PCB				
ALPHA BHC (NG/L)		DET'N LIMIT = 1.000		GUIDELINE = 700 (G)
JAN	1.000 <T	1.000 <T	.	BDL
MAR	BDL	1.000 <T	.	2.000 <T
MAY	2.000 <T	1.000 <T	.	2.000 <T
JUL	1.000 <T	1.000 <T	.	2.000 <T
SEP	BDL	BDL	.	BDL
NOV	2.000 <T	2.000 <T	.	1.000 <T
LINDANE (NG/L)		DET'N LIMIT = 1.000		GUIDELINE = 4000 (A1)
JAN	BDL	BDL	.	BDL
MAR	BDL	BDL	.	BDL
MAY	1.000 <T	BDL	.	BDL
JUL	BDL	BDL	.	BDL
SEP	BDL	BDL	.	BDL
NOV	BDL	BDL	.	BDL
ATRAZINE (NG/L)		DET'N LIMIT = 50		GUIDELINE = 60000 (A2)
JAN	430.000 <T	130.000 <T	.	.
MAR	BDL	BDL	.	.
MAY	250.000 <T	BDL	.	.
JUL	100.000 <T	100.000 <T	.	.
SEP	110.000 <T	100.000 <T	.	.
NOV	BDL	BDL	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
PHENOLICS (UG/L)	PHENOLICS		DET'N LIMIT = .200	GUIDELINE = 2 (A4)
JAN	.400 <T	.400 <T	.	.
MAR	IRE	.600 <T	.	.
MAY	.600 <T	BDL	.	.
JUL	BDL	BDL	.	.
SEP	BDL	BDL	.	.
NOV	.600 <T	.600 <T	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
VOLATILES				
BENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)
JAN	BDL	BDL	.	BDL
MAR	BDL	.100 <T	.	.100 <T
MAY	BDL	BDL	.	BDL
JUL	BDL	BDL	.	BDL
SEP	BDL	BDL	.	BDL
NOV	BDL	BDL	.	BDL
TOLUENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 24 (A3)
JAN	BDL	BDL	.	BDL
MAR	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
JUL	.100 <T	BDL	.	.050 <T
SEP	.100 <T	.050 <T	.	BDL
NOV	BDL	BDL	.	BDL
ETHYLBENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 2.4 (A3)
JAN	BDL	BDL	.	BDL
MAR	.100 <T	.250 <T	.	.100 <T
MAY	BDL	BDL	.	BDL
JUL	BDL	.050 <T	.	.050 <T
SEP	.050 <T	BDL	.	BDL
NOV	.050 <T	BDL	.	.050 <T
STYRENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (D1)
JAN	BDL	.050 <T	.	.050 <T
MAR	.150 <T	.200 <T	.	.200 <T
MAY	BDL	BDL	.	BDL
JUL	.050 <T	.050 <T	.	.050 <T
SEP	.100 <T	BDL	.	.050 <T
NOV	.100 <T	BDL	.	.100 <T
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)
JAN	BDL	10.700	.	8.400
MAR	BDL	13.400	.	10.500
MAY	BDL	25.000	.	10.900
JUL	.300 <T	13.600	.	14.800
SEP	BDL	17.800	.	10.000
NOV	BDL	9.200	.	5.200
111, TRICHLOROETHANE (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 200 (D1)
JAN	BDL	BDL	.	BDL
MAR	.040 <T	BDL	.	BDL
MAY	BDL	BDL	.	BDL
JUL	BDL	BDL	.	BDL
SEP	BDL	BDL	.	BDL
NOV	BDL	BDL	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM GRIMSBY WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
DICHLOROBROMOMETHANE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 350 (A1+)
JAN	BDL	10.850	.	9.350
MAR	BDL	11.750	.	9.100
MAY	BDL	11.100	.	8.800
JUL	.250 <T	11.050	.	10.850
SEP	BDL	12.450	.	9.500
NOV	BDL	10.800	.	7.200
CHLORODIBROMOMETHANE (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 350 (A1+)
JAN	BDL	7.100	.	6.700
MAR	BDL	6.800	.	5.400
MAY	BDL	2.900	.	3.800
JUL	.200 <T	6.600	.	5.800
SEP	BDL	6.200	.	6.100
NOV	BDL	9.000	.	6.300
BROMOFORM (UG/L)		DET'N LIMIT = 0.20		GUIDELINE = 350 (A1+)
JAN	BDL	.800 <T	.	.800 <T
MAR	BDL	.800 <T	.	.600 <T
MAY	BDL	BDL	.	.400 <T
JUL	BDL	.600 <T	.	.600 <T
SEP	BDL	.800 <T	.	.800 <T
NOV	BDL	1.400 <T	.	1.200 <T
TOTL TRIHALOMETHANES (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = 350 (A1)
JAN	BDL	29.500	.	25.250
MAR	BDL	32.750	.	25.600
MAY	BDL	39.000	.	23.500
JUL	.750 <T	31.850	.	32.000
SEP	BDL	27.200	.	26.450
NOV	BDL	30.450	.	19.800

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL
This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: P0C0D0 UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION: **NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled

Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)
Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)
Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top

<u>Steps:</u>

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.